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Comparisons, mental models, and the action effect in judgments of regret

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People tend to attribute more regret to a character who has decided to take action and experienced a negative outcome than to one who has decided not to act and experienced a negative outcome. For some decisions, however, this finding is not observed in a between-participants design and thus appears to rely on comparisons between people's representations of action and their representations of inaction. In this article, we outline a mental models account that explains findings from studies that have used within- and between-participants designs, and we suggest that, for decisions with uncertain counterfactual outcomes, information about the consequences of a decision to act causes people to flesh out their representation of the counterfactual states of affairs for inaction. In three experiments, we confirm our predictions about participants' fleshing out of representations, demonstrating that an action effect occurs only when information about the consequences of action is available to participants as they rate the nonactor and when this information about action is informative with respect to judgments about inaction. It is important to note that the action effect always occurs when the decision scenario specifies certain counterfactual outcomes. These results suggest that people sometimes base their attributions of regret on comparisons among different sets of mental models.

The outcomes of our decisions often evoke in us strong emotional reactions. Thus, the successful investor may experience elation, and the unsuccessful investor may feel dejected, regretful, or disappointed. The regret to which a negative outcome gives rise is determined, at least in part, by a comparison of the factual outcome and some counterfactual alternative or reference point (see, e.g., Baron & Ritov, 1994; Boles & Messick, 1995; Kahneman & Miller, 1986; Mellers, 2000; Ritov & Baron, 1995). The referent of this comparison may be the most easily imaginable alternative outcome (Kahneman & Miller, 1986), an alternative outcome that one has observed (Mellers, Schwartz, & Ritov, 1999), an outcome achieved by another person (Boles & Messick, 1995), or the status of things before the decision was made (Baron & Ritov, 1994). In this article, we will be concerned with how best to understand the comparisons that determine how much regret people attribute to decision makers who have made different decisions but achieved the same negative outcome.

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Our concern with decision makers who make different decisions but achieve the same outcome stems from the literature on the *action effect*. One of the best-known claims to have been made about the role of comparisons in determining the emotional consequences of decision making is that when negative outcomes follow action, these outcomes are more painful than the same outcomes when they result from inaction. The earliest finding in the literature about the action effect is that people attribute more regret to an actor than to a nonactor following a negative outcome (Kahneman & Tversky, 1982). Participants in Kahneman and Tversky's experiment received the following scenario:

> Mr. Paul owns shares in company A. During the past year he considered switching it to stock in company B, but he decided against it. He now finds that he would have been better off by $1,200 if he had switched to the stock of company B. Mr. George owned shares in company B. During the past year he switched to stock in company A. He now finds out that he would have been better off by $1,200 if he had kept his stock in company B. Who feels greater regret? (p. 142)

A large majority of the participants in this study felt that Mr. George, the actor, would feel more regret. This action effect has been replicated and generalized to positive outcomes (in which the questions asked concerned feelings of joy) by Landman (1987) and Gleicher et al. (1990).

An early explanation for the action effect was that inaction is more normal than action (Kahneman & Miller,

1986). Accordingly, it is easier to generate a counterfactual in which an actor did not act than it is to generate a counterfactual in which a nonactor acted. Kahneman and Miller appeal to this asymmetry in the generation of counterfactuals for action and inaction in order to explain the action effect. The relative ease with which a counterfactual state of affairs can be imagined for the actor is said to lead participants to estimate that he would feel greater regret.

The fact that a temporal aspect to the action effect exists has been demonstrated by Gilovich and Medvec (1994), who gave participants the following scenario:

> Dave and Jim do not know each other but both are enrolled at the same elite East Coast University. Both are only moderately satisfied where they are and both are considering transferring to another prestigious school. Each agonises over the decision, going back and forth between thinking he is going to stay and thinking he will leave. They ultimately make different decisions: Dave opts to stay where he is and Jim decides to transfer. Suppose their decisions turn out badly for both of them: Dave still doesn't like it where he is and wishes he had transferred, and Jim doesn't like his new environment and wishes he had stayed. (p. 360)

Gilovich and Medvec observed the standard action effect when participants were asked who would feel more regret in the short term. However, when the question concerned long-term regret, participants were more likely to attribute greater regret to the nonactor.

In this article, we wish to present a modified version of the mental models account of the action effect (see Byrne & McEleney, 2000). The mental models theory of thinking was originally devised to account for people's deductive reasoning (see Johnson-Laird, 1983; Johnson-Laird & Byrne, 1991). It has also been used to analyze probabilistic (see Johnson-Laird, P. Legrenzi, Girotto, M. S. Legrenzi, & Caverni, 1999) and counterfactual (see Byrne, 1997, 2002; Thompson & Byrne, 2002) thinking. According to the mental models theory, people reason by representing discrete states of affairs that are consistent with the information given to them in the problem scenario. These representations take the form of mental models.

Recently, Byrne and McEleney (2000) have sketched how the mental models theory might account for the action effect. According to Byrne and McEleney, the action effect occurs because people have a more explicit representation of action than they do of inaction. Thus, people construct two models to represent the decision made by Mr. George, the actor in the investment scenario:

Current:	Company A
Past:	Company B

The first of these models corresponds to the actual state of affairs in which Mr. George has traded his stock and missed out on a profit, whereas the second refers to the counterfactual state of affairs in which he did not trade his stock and made a profit. Byrne and McEleney claim that, because the current and past states of affairs for the nonactor are identical, the initial model set for Mr. Paul, the nonactor, is more economical than for Mr. George. Thus, people have just one model in their initial representation of the nonactor. The action effect in the investment scenario occurs because the comparison between people's model of what actually happened and their model of what might have happened results in a higher rating of regret for the actor. Because the model set for inaction does not contain a counterfactual model, no comparison can be made, and less regret is attributed to the character who decided not to act.

Byrne and McEleney (2000) also point out that the investment and university scenarios are dissimilar because counterfactual outcomes are fixed in the former, whereas they are uncertain in the latter. Thinking counterfactually, we know for sure that if Mr. Paul had traded his stock he would have been better off by $1,200 and that if Mr. George had not traded his stock he would have been better off by $1,200. In the university scenario, however, we don't know how Dave would have fared had he moved. According to Byrne and McEleney, this uncertainty about the counterfactual for inaction leads to the occurrence of an *inaction effect* in the long term. According to them, people base short-term judgments of regret for Dave on an economical initial representation containing an unfleshed-out mental model in which Dave is currently at College A and unhappy. Because the representation of the actor's situation is explicit (i.e., it contains a model corresponding to the pre- and postaction states of affairs), an action effect occurs in the short term. However, people ascribe long-term regret to Dave on the basis of a fully fleshed-out representation that contains models corresponding to the factual state of affairs as well as to the counterfactual states of affairs in which he moved and was unhappy and in which he moved and was happy. The recognition of this last possibility leads to the occurrence of the inaction effect in the long term (see Gilovich & Medvec, 1994). Byrne and McEleney confirmed—as predicted by their account—that for the investment scenario participants do not switch to inaction regrets in the long term.

An experiment described by N'gbala and Branscombe (1997), who gave the investment scenario to three groups of participants, raises problems for Kahneman and Miller's (1986) and Byrne and McEleney's (2000) accounts of the action effect. The participants in the first group received the standard scenario and were asked to estimate the regret felt by each character, and the participants in the other two groups received information about, and gave regret estimates for, either the actor or the nonactor. Although an action effect occurred with the standard scenario, no difference was found in the amount of negative emotion attributed to the characters when participants received information about only one character. In addition, participants who received information about both characters were equally likely to mutate the actor's and the nonactor's behaviors in an "if only" sentence-completion task. N'gbala and Branscombe suggested that comparisons between the characters underlie the action effect observed in participants who receive the investment scenario.

The primary aim of this article is to examine how a mental models approach may be reconciled with the finding that the use of a within-participants design is often neces-

sary (but not always; see, e.g., J. J. Seta, McElroy, & C. E. Seta, 2001; Zeelenberg, van den Bos, van Dijk, & Pieters, 2002) to cause the occurrence of an action effect. To this end, we wish to suggest that people's initial mental model representations for action and inaction may be somewhat different from those suggested by Byrne and McEleney (2000). We suggest that people might always construct at least two, and sometimes three, mental models. Under our proposal, one of these models corresponds to the factual state of affairs and another to an upward counterfactual state of affairs with a positive outcome (see, e.g., K. D. Markman, Gavanski, Sherman, & McMullen, 1993).

The suggested model sets for the characters in the investment and university scenarios are shown in Table 1. As we have already noted, the nature and number of the counterfactuals for each of the characters in the investment scenario are fixed by the nature of the decision described therein. Because only one factual model and one upward counterfactual model are possible, when considering two models people construct a fully fleshed-out representation for each of the decisions described in the investment scenario. Strong support for this claim comes from N'gbala and Branscombe's (1997) finding that, when considering the investment scenario, people are as likely to mutate inaction as they are action.

The university scenario differs from the investment scenario in that it imposes fewer constraints on counterfactual possibilities. That is, both Dave, the nonactor, and Jim, the actor, in the university scenario might have made the opposite decision and been happy or unhappy. In our proposal, the initial representation for Dave contains one factual model and just one counterfactual model. Dave is described as wishing he had moved. Given the negative outcome arising from his decision not to act, we expected participants to generate the upward counterfactual in which he moved and was happy (see K. D. Markman et al., 1993). The suggested model set for Jim, on the other hand, contains two counterfactual models, one in which he did not transfer and was happy (the upward model, see K. D. Markman et al., 1993) and one in which he did not transfer and was unhappy. Because Jim was unhappy at College A before deciding to transfer, it is possible that he would have continued to be unhappy had he decided not to transfer. Because this state of affairs was described in the scenario, the corresponding downward counterfactual model is likely to be available to participants along with the upward counterfactual model.

When people learn of each character individually (as they did in N'gbala & Branscombe's 1997 experiment), so that comparisons between characters are not possible, the ratings of regret for each character are likely to be driven by a comparison *within* the model set for that character (see Byrne & McEleney, 2000). This comparison is between the factual and counterfactual models for the character's decision. In the case of each of the characters described in Table 1, there is a gap between what happened and what might have happened. Mr. George regrets the loss that arose from trading his stock, and Mr. Paul regrets the loss that occurred due to his failure to move his investment. Dave regrets his decision not to move because he might have been happy at College B. Finally, regret is attributed to Jim because his decision to move, which resulted in a negative outcome, is compared either to a counterfactual in which he did not move and was happy or to a counterfactual state of affairs in which he did not move and continued to be unhappy. Although the unhappy outcome was equally bad for Jim and Dave, Jim's situation was made even worse by the fact that he was just as unhappy following the upheaval involved in moving from College A to College B. Because there are grounds for the attribution of significant amounts of regret to each of these four characters, when information about them was presented in a between-participants design, no action effect occurred for the investment scenario (see N'gbala & Branscombe, 1997), and we expected no action effect to occur for the university scenario.

We argue that, in a within-participants design, an action effect occurs for the investment scenario because people ascribe regret to the characters in the scenario on the basis of a comparison *between* model sets (see N'gbala

Table 1
Suggested Initial Model Sets for the Actor and Nonactor in the Investment and University Scenarios

Investment Scenario		
Mr. George (Actor)		
Factual possibility	Moves from Company B to Company A	Worse off by $1,200
Counterfactual possibility	Stays with Company B	Better off by $1,200
Mr. Paul (Nonactor)		
Factual possibility	Stays with Company A	Worse off by $1,200
Counterfactual possibility	Moves from Company A to Company B	Better off by $1,200
University Scenario		
Jim (Actor)		
Factual possibility	Moves from College A to College B	Unhappy
Counterfactual possibilities	Stays at College A	Happy
	Stays at College A	Unhappy
Dave (Nonactor)		
Factual possibility	Stays at College A	Unhappy
Counterfactual possibility	Moves from College A to College B	Happy

& Branscombe, 1997). Each of these model sets contains a factual model with a negative outcome and a counterfactual model with a positive outcome. Comparison between model sets is facilitated by their similarity, which makes them more alignable (see Gentner & A. B. Markman, 1997) and hence easier to compare (for a discussion of automaticity, similarity processing, and comparison, see A. B. Markman & Gentner, 2005). The processing of similarities between the model sets for each character has the paradoxical effect of making the difference between the decisions they represent more salient (see Gentner & Gunn, 2001). There are several ideas in the literature about the differences between actions and inactions that result in the same negative outcome. Accordingly, more regret may be attributed to an unsuccessful actor because he might be regarded as less wise (N'gbala & Branscombe, 1997), or more responsible for the negative outcome (Zeelenberg, van der Pligt, & de Vries, 2000). Another possibility, which is consistent with previous work on the action effect (see Kahneman & Miller, 1986; Kahneman & Tversky, 1982), is that more regret may be attributed to the actor because the counterfactual for the actor can be generated more easily than can the counterfactual for the nonactor.

Although comparisons between the actor and the nonactor may be relatively straightforward for the investment scenario, they are less likely to be so for the university scenario. This is because there is uncertainty about what would have befallen Dave, the nonactor, had he transferred. There are two possible counterfactuals for Dave: Had he transferred, Dave might have been happy or he might have been unhappy. We suggested above that people may initially represent the counterfactual state of affairs in which Dave transferred and was happy. However, information about Jim appears to suggest that this counterfactual is unlikely to capture what would have happened had Dave transferred. After all, Jim also transferred, and he was still unhappy. Therefore, the factual outcome for Jim may suggest to people that their initial representation for Dave was incomplete. We suspect that this may cause participants to flesh out their model set for Dave so that it includes a model corresponding to a state of affairs in which Dave transferred and was unhappy.

After the fleshing-out process, the model set for each character specifies a negative factual state of affairs, as well as positive and negative counterfactual states of affairs. Accordingly, with both of these characters there is considerable uncertainty about whether a different decision would have resulted in a positive outcome. In this sense, attributions of regret based on within-model set comparisons would not result in an action effect. However, just as was the case for the investment scenario, the similarities in the representations of decisions may facilitate a comparison between model sets and thus lead to the differences between sets becoming salient. As we have seen, once the difference between action and inaction becomes the focus of comparison, on any of several grounds, more regret may be attributed to the actor.

We saw several ways to test our proposals about how action and inaction are represented. For example, we knew that comparisons between the characters were necessary for an action effect to occur in the investment scenario (N'gbala & Branscombe, 1997). In Experiment 1, we verified that this was also true for the university scenario. In Experiments 1 and 2, we tested for order effects in judgments of regret. Our central proposal about the action effect in the university scenario was that it occurred because information about a decision to act with a negative outcome would cause participants to flesh out their representation of an inaction decision. On the other hand, information about a decision not to act with a bad outcome would not lead participants to flesh out their representation of an action decision. Thus, even in a within-participants design we did not expect to observe an action effect with the university scenario when people read about and rate Dave, the nonactor, before they read about and rate Jim, the actor. If information about Jim were unavailable to participants when they were thinking about Dave, they would not flesh out their representation of Dave's decision. Accordingly, we expected there to be an asymmetry between people's model sets for action and inaction, an asymmetry which, we suggested, would make people less likely to base their attributions on a comparison between model sets. However, if information about Jim's decision outcome were available to participants when they made a regret judgment for Dave, they would base that judgment on a fleshed-out model set for Dave. This would then lead to the generation of highly similar model sets for action and inaction, to comparisons between model sets and, therefore, to the occurrence of an action effect.

EXPERIMENT 1
Manipulating Order in the University Scenario

In Experiment 1, we employed a design that allowed us to control for the order in which participants read about the characters. In this design, participants first read a description of, and provided regret ratings for, one character and then the other. The participants in one experimental condition initially provided regret ratings for Jim, the actor, without any knowledge of Dave, the nonactor; the participants in the other experimental condition initially provided regret ratings for Dave without any knowledge of Jim. Only after they had provided these ratings were participants given a description of, and asked to make a regret rating for, the second character.

Because each set of participants initially read about, and rated, a different character, this design allowed us to see whether N'gbala and Branscombe's (1997) finding that the action effect does not occur in a between-participants design would generalize from the investment to the university scenario. This design also allowed us to test our predictions about fleshing out. We had suggested the following: (1) that the action effect may be due to a comparison between people's mental representations for action and inaction; (2) that people may compare Dave and Jim because their mental representations for both may be similar—both may contain a negative factual model as well as a positive and a negative counterfactual model;

and (3) that people's model set for Dave may contain a counterfactual with a negative outcome as well as a counterfactual with a positive outcome only because information about Jim may contradict the model in people's initial representation in which Dave moved and was happy. If these claims were correct, then we speculated that an action effect would only be observed when information about Jim was available to participants as they read about and rated Dave. Thus, we predicted that an action effect would occur when people received information about Jim before they received information about Dave, and that no effect would occur when the information was received in the opposite order.

Method

Participants and Procedure. A total of 150 students at the University of Plymouth participated in this experiment. The participants read and rated their scenarios individually.

Design. The experiment had a 3 × 2 mixed design. The within-participants factor was the character rated and had two levels, since all participants provided a regret rating for both the actor and the nonactor. We will refer to the between-participants variable, which had three levels, as our experimental condition variable. One group of participants received information about the characters together (the control condition), and the other two groups received this information sequentially. One of the latter two groups received information about the actor prior to receiving information about the nonactor (the actor–nonactor condition), and the final group received information about the nonactor first (the nonactor–actor condition).

Materials. We used three sets of materials. The first set contained the university scenario used by Gilovich and Medvec (1994). After reading the scenario, the participants were asked to estimate on a pair of lines—each line 100 mm long—the degree of regret felt by the actor and the nonactor upon learning of the outcome of their respective decisions. One end of each scale was labeled *low regret* and the other was labeled *high regret*. The order in which these scales appeared on the page was counterbalanced.

The other two sets of materials were constructed by separating the information concerning the actor and the nonactor. Thus, the participants in the actor–nonactor condition initially read about Jim, a college student who was unhappy at his current university and decided to go elsewhere. This description was followed with a rating scale identical to those used in the control condition, in which the participants made regret ratings for Jim. Next, this group of participants read about Dave, a college student who, although he was unhappy at his current university, decided not to transfer to another institution. This second description was also followed by a rating scale. The participants in the nonactor–actor condition received the same descriptions and rating scales, but in the opposite order. The descriptions were presented on separate pages, and the participants were required to make their judgment about the first character before reading about the second. All three groups of participants were told that the characters did not know one another. This information appeared at the start of the control materials and at the start of the second description for the actor–nonactor and the nonactor–actor materials.

Results

Our participants' estimates on the 100-mm lines were converted to ratings on a 100-point scale in which higher ratings indicated greater estimated regret. To examine whether N'gbala and Branscombe's (1997) finding of a null effect in a between-participants design would generalize from the investment to the university scenario, we compared the mean regret rating for the actor when information about him was presented first ($M = 75.54$; $SD = 20.76$) with the mean regret rating for the nonactor when he was presented first ($M = 76.08$; $SD = 19.98$). The difference between these means was nonsignificant [$t(1,98) = 0.13$].

Of most interest in the results of the 3 × 2 mixed design ANOVA, which we carried out to test our predictions about the effect of information order on the action effect, was the interaction between character and experimental condition, which fell just short of statistical significance [$F(2,147) = 2.62$, $MS_e = 381.09$, $p < .08$]. The means involved in this interaction are presented in Figure 1. Because we had made strong predictions for this interaction, we used planned comparisons to test for significant differences between the means involved. These tests revealed that a significant action effect occurred in the control condition [$F(1,147) = 10.22$, $MS_e = 381.10$, $p < .002$] and in the condition in which the nonactor was rated second

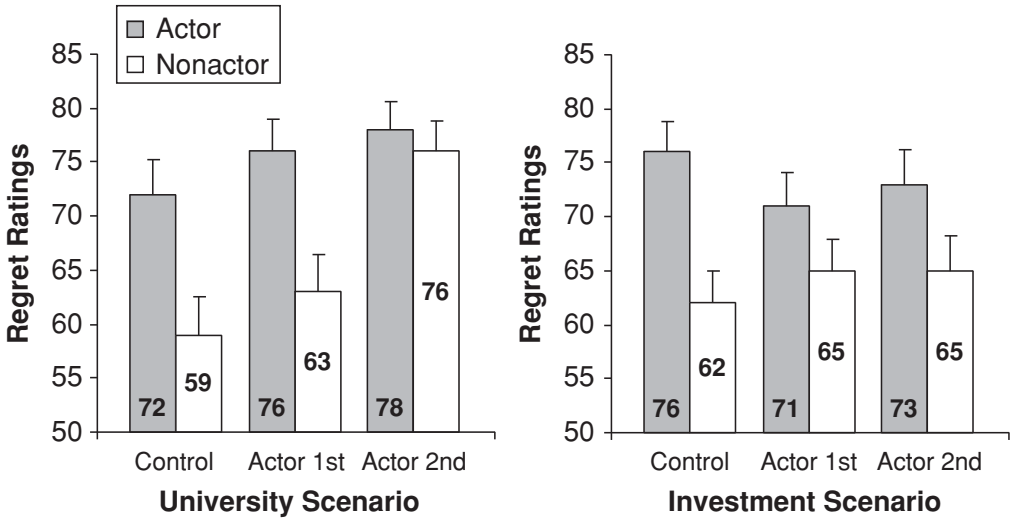

Figure 1. Mean regret ratings from Experiment 1 (on the left) and Experiment 2 (on the right).

[$F(1,147) = 9.92$, $MS_e = 381.10$, $p < .002$]. However, in the condition in which the participants received and rated a description of the nonactor first, no action effect was observed [$F(1,147) < 0.2$]. Before we discuss these results, we will describe the results of Experiment 2, in which we used the same procedure to investigate order effects in the investment scenario.

EXPERIMENT 2
Manipulating Order in the Investment Scenario

We predicted that character order would determine whether an action effect would occur for the university scenario in Experiment 1 because information about an unsuccessful actor may contradict people's initial model of the counterfactual for Dave in which he moved and was happy. This contradiction may cause people to flesh out their representation of Dave so that it contains counterfactual models corresponding to the state of affairs in which he moved and was unhappy as well as the state of affairs in which he moved and was happy. As a result of the fleshing-out process, people's representations of action and inaction are likely to be similar and regret is likely to be attributed on the basis of a comparison between model sets. However, in the investment scenario, we suggested that people's initial model sets for action and inaction are similar without the need for fleshing out. Had Mr. Paul moved his stock he would have been better off, and had Mr. George not moved his stock he would have been better off. For each decision, the factual outcomes are negative, and the only counterfactual possibility has a positive outcome. Thus, information about the actor is likely to convey nothing beyond what is contained in people's initial representation of inaction. Just as we predicted for the university scenario, we hypothesized that more regret would be attributed to the nonactor in the investment scenario on the basis of a comparison between the highly similar model sets. Crucially, since we proposed that a fleshing-out process does not underlie the action effect in this scenario, we should have observed the effect regardless of the order in which participants read about and rated the characters.

Method

Participants and Procedure. A total of 153 visitors to Durham University participated in this experiment. The participants individually read and rated the characters in their scenarios in group sessions that had no time limits.

Design. The experiment had a 3 (experimental condition) × 2 (character) mixed design.

Materials. We used three sets of materials. The first set contained a version of the investment scenario (Kahneman & Tversky, 1982). The companies in the scenario were called Omex and Revon. After reading the scenario, the participants were asked to estimate on a 10-point scale the degree of regret felt by the actor and the nonactor upon learning of the outcome of their respective decisions. One end of each scale was labeled *no regret* and the other was labeled *very high regret*. The order in which these scales appeared on the page was counterbalanced.

The other two sets of materials were constructed by separating the information concerning the actor and the nonactor. Thus, the participants in the actor–nonactor condition initially read about Mr. George, who decided to trade his stock. After the participants completed a scale identical to those used in the control condition, this group read about Mr. Paul. A rating scale followed this second description. The participants in the nonactor–actor condition received the same descriptions and rating scales, but in the opposite order. The descriptions were presented on separate pages, and the participants were required to make their judgment about the first character before reading about the second.

Results

For consistency with Experiment 1, the participants' estimates on the 10-point scale used in this experiment were converted to ratings on a 100-point scale in which higher ratings indicated greater attributed regret. Mean ratings, broken down by experimental condition and character, are shown in Figure 1. To test whether we had replicated N'gbala and Branscombe's (1997) finding of a null effect when information about each character is presented separately to different groups of participants, we compared the mean regret rating for the actor when he was presented first ($M = 71.4$; $SD = 21.76$) with the mean for the nonactor when he was presented first ($M = 65.19$; $SD = 23.47$). The difference was nonsignificant [$t(100) = 1.38$, $p > .15$].

A 3 × 2 mixed design ANOVA yielded a nonsignificant interaction between character and experimental condition [$F(2,150) = 1.98$, $MS_e = 217.41$, $p > .14$]. Planned comparisons revealed that, as was the case for the university scenario, a significant action effect occurred with the integrated version of the investment scenario [$F(1,150) = 22.73$, $MS_e = 217.41$, $p < .001$] as well as with the condition in which the participants rated the actor first [$F(1,150) = 4.14$, $MS_e = 217.41$, $p < .05$]. Contrary to the results obtained in Experiment 1, planned comparisons also revealed that a significant action effect occurred when the participants rated the nonactor first [$F(1,150) = 7.80$, $MS_e = 217.41$, $p < .01$].

Discussion of Experiments 1 and 2

We replicated N'gbala and Branscombe's (1997) finding that no action effect occurs for the investment scenario when different groups of participants read about each character separately. We also have shown that this finding generalized to the university scenario. Thus, the results of Experiments 1 and 2 support the claim that the action effect, which occurs when participants are presented with the university and investment scenarios, is caused by the participants' comparisons between the actor and nonactor. In addition, we only observed an action effect in the university scenario, when information about the actor was available to participants while they were judging the nonactor, whereas the action effect was observed in the investment scenario regardless of the order in which the characters were presented. These findings support our speculation that in the university scenario, in which counterfactual outcomes are uncertain, when information is given to people about an unsuccessful action, this may cause them to flesh out their representation of inaction. As

a result of this fleshing-out process, people's representations of both factual and counterfactual outcomes for each decision are negative. In the investment scenario, in which no fleshing out takes place, the actual outcomes for both decisions are negative, whereas the counterfactual outcomes are positive. In both the investment and university scenarios, therefore, there was likely to be parity between the actual and counterfactual outcomes that were represented for each character. In each case, it was only the decision that led to the actual outcome that differed between characters, and less regret was attributed to the nonactor because his decision was judged more wise (N'gbala & Branscombe, 1997), less responsible for the outcome (see Zeelenberg et al., 2000), or less mutable (see Kahneman & Tversky, 1982) than the alternative decision to act.

EXPERIMENT 3

We claimed that the initial model set for Dave, the nonactor in the university scenario, contained a model corresponding to the counterfactual state of affairs in which Dave moved and was happy. However, information about the factual state of affairs for the actor suggested that this representation was incomplete. Accordingly, people may flesh out their representation of the nonactor so that it includes a model of the counterfactual state of affairs in which Dave moved and was unhappy. It is important to note that people's initial representation of Dave is insufficient only if they assume that what has befallen Jim would also befall Dave. If there is reason to suspect that what happened to Jim is not a good guide for making predictions about Dave, then the initial representation for Dave may well be sufficient, the process of fleshing out unnecessary, the similarity between model sets for each character decreased and, hence, the action effect nonexistent.

In Experiment 3 we tested our suggestion about fleshing out by manipulating the similarity that was said to hold between the characters in the university scenario. The rationale for our manipulation was the following: The more similar the two characters are, the more likely it is that the nonactor—had he moved—would have been just as unhappy as the actor. Conversely, the less similar characters are said to be, the less likely it is that the nonactor—had he acted—would have ended up with the same outcome as the actor. We expected the outcome for the actor to be informative in the former case but not in the latter. Therefore, fleshing out was likely to take place in the former case, leading to the occurrence of an action effect. On the other hand, fleshing out was less likely to occur in the latter case, and no action effect should have been observed.

Method

Participants and Procedure. Fifty-four undergraduate students from a variety of departments at Durham University participated in this experiment. The participants completed their ratings individually in several group sessions that had no time limits.

Materials and Design. This experiment had a 2 × 2 × 2 mixed design. All the participants received a variant of the integrated university scenario used in Experiment 1. The between-participants variable was the similarity said to hold between the actor's and the nonactor's situations. This variable was achieved by adding a sentence after the first sentence of the standard university scenario (the exact text of this scenario is presented in the introduction). For the participants in the group that received the *similar* condition, this sentence read "Psychological testing, administered to all new students of the university, has shown them to be highly similar in all respects." For the participants in the *dissimilar* condition, the word *similar* in this statement was changed to *dissimilar*.

All the participants provided regret ratings on separate scales for both the actor and the nonactor. The order in which these scales appeared was counterbalanced. In this experiment, we used an 11-point scale labeled *no regret* at one end and *high regret* at the other. All the participants were asked to provide regret ratings for both characters in the short and in the long term (see Byrne & McEleney, 2000; Gilovich & Medvec, 1994). However, for ease of exposition, here we will report only the results for participants' short-term ratings of regret.

Results and Discussion

Prior to analyzing the results of the experiment, we converted participants' regret ratings on the 11-point scale to scores on a 100-point scale. This was done for consistency between this experiment and Experiments 1 and 2. The rescaled means and standard errors for the regret ratings from this experiment can be seen in Figure 2. A 2 × 2 mixed design ANOVA revealed a marginally significant interaction between character and similarity [$F(1,52) = 3.10$, $MS_e = 521.53$, $p < .09$]. With regard to the condition in which the characters were said to be highly similar, planned comparisons revealed a significant action effect [$F(1,52) = 11.65$, $MS_e = 521.53$, $p < .002$]. However, in the *dissimilar* condition, there was no evidence for such an effect [$F(1,52) < 0.9$].

The results of this experiment show that it is possible to block the action effect by informing the participants that the characters described in the university scenario are dissimilar. This finding further supports our claims about the representations of action and inaction that underlie the action effect. When the characters are dissimilar, the information people receive about the factual state of affairs for Jim does not suggest to them that their initial representation for

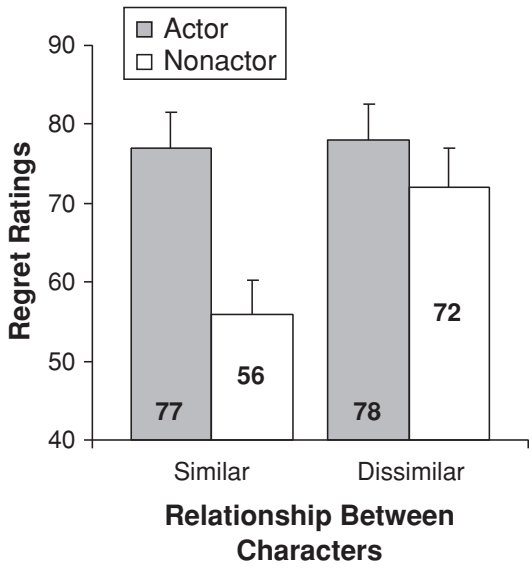

Figure 2. Mean regret ratings from Experiment 3.

Dave is incomplete. Because their characters are dissimilar, Dave could very well have been happy had he moved, even though Jim has moved and is unhappy. There is no need for fleshing out, and without fleshing out, the model sets for the characters are different, Dave and Jim have separate grounds for regret, and an action effect does not occur.

When the characters are similar, on the other hand, information about what has befallen Jim may suggest to people that their initial representation for Dave is unsatisfactory. We suggest that this necessitates a fleshing-out process, leading to a model set for each character that contains a negative factual outcome and several uncertain counterfactual outcomes. These model sets differ only in the decisions that led to the factual outcomes. Since Dave has not acted to bring about the negative outcome, his decision is judged wiser, less responsible, or less mutable than Jim's; thus, less regret is attributed to him.

GENERAL DISCUSSION

We have outlined a revised mental models account of the action effect in judgments of regret and reported the results of three experiments in support of our account. Under this account, people construct mental models of the actual and counterfactual states of affairs for the decisions made by each of the characters described in the scenarios that are most commonly used to demonstrate the action effect. The action effect occurs because the model sets for each decision are highly alignable (see Gentner & A. B. Markman, 1997). That is, both contain one factual, one upward counterfactual, and for some decisions, one downward counterfactual model. All that differs between the model sets is the decision made by each character leading up to a negative outcome, and less regret is attributed to the nonactor because he has not acted to bring about the negative outcome. It is important to note that in cases with uncertain counterfactual outcomes this comparison between the characters is preceded by a fleshing-out process in which information about the unsuccessful actor leads to a modulation (Johnson-Laird & Byrne, 2002) of the initial model set for the nonactor.

For a scenario with uncertain counterfactual outcomes, we have shown that an action effect occurs only when information about the actor is available to participants while they are judging the nonactor. This finding does not generalize to scenarios with certain counterfactual outcomes. When the scenario with uncertain counterfactual outcomes was manipulated so that the factual outcome for the actor was unlikely to tell us what would have happened to the nonactor had he acted, no action effect was observed. That is, fleshing out occurred only when information about the actor suggested that the initial representation for the nonactor was insufficient. In the absence of a fleshing-out process, each character had separate grounds for feeling bad, and regret was attributed on the basis of a comparison within the model set for each decision—between what happened and what might have happened.

Unsurprisingly, our modified account of the action effect contains several similarities to the account sketched by Byrne and McEleney (2000). In their account, just as in ours, the participants construct mental models that correspond to factual and counterfactual states of affairs. Their account also stresses the difference between decisions whose counterfactual outcomes are certain and those whose counterfactual outcomes are uncertain. Both accounts appeal to fleshing-out processes in order to explain the effects of experimental manipulations and both suggest the existence of asymmetries in people's initial representations for action and inaction.

However, there are also some differences between Byrne and McEleney's (2000) account and ours. For example, we suggest that the asymmetry between action and inaction with respect to the number of models in the initial model set occurs only for decisions with uncertain outcomes. For decisions with certain outcomes, we assume that people construct fully fleshed-out representations for action and inaction. For decisions with uncertain counterfactual outcomes, we assume that people construct a fully fleshed-out set of models to represent an unsuccessful action, whereas to represent a decision not to act people construct a partially fleshed-out representation, containing models for factual and upward counterfactual states of affairs. Byrne and McEleney, on the other hand, claim that people initially construct a partially fleshed-out representation containing a factual and a counterfactual model for action, but they initially only explicitly represent the factual state of affairs for inaction. Under Byrne and McEleney's account, the counterfactual outcomes for inaction are fleshed out only when people are asked to make a judgment about regret in the long term. Fleshing out is also important in our account. However, in situations with more than one possible counterfactual outcome, we suggest that fleshing out occurs when information about an unsuccessful action leads people to believe that their initial representation of inaction is unsatisfactory or incomplete.

Byrne and McEleney (2000) sketched their account of the action effect was sketched in order to account for the effect of temporal perspective on attributions of regret. According to Gilovich and Medvec (1994), although action is regretted in the short term, a variety of cognitive and motivational factors combine to make inaction more regrettable than action in the long term. Byrne and McEleney showed that a long-term inaction effect only occurs with the university scenario and that regret is attributed to action in the investment scenario in the short and the long term. Byrne and McEleney attributed this finding to the uncertainty about the counterfactual outcome for Dave, the character who did not move, in the university scenario. According to Byrne and McEleney, people only represent the factual state of affairs for Dave in the short term, but they flesh out their representation to include the upward and downward counterfactuals when asked about long-term regret. According to our account, people's representation for Dave's decision not to act includes a factual and an upward counterfactual model from the start. The fleshing-out process, which is prompted by information about Jim's action with negative consequences, causes people to change their representation of

the counterfactual for Dave. However, information about Jim does not suggest that it is impossible that Dave would have been happy had he moved. Although it is likely that Dave would have been unhappy, it may be the participants' intuition that Dave would come to rue the possibility of happiness that he has missed by not moving, and thus participants expect him to experience regret with the passing of time. Accordingly, they attribute greater regret to Dave in the long term.

Although many of the elements in our account are consistent with existing claims about how people think with mental models, we are making at least one novel distinction. Like Byrne and McEleney (2000), we suggest that people may construct a model set for each of the characters described in the scenario and that regret is often attributed on the basis of a comparison between the models within this model set. However, unlike Byrne and McEleney, we claim that people may sometimes make a judgment on the basis of a comparison between model sets. We make this suggestion because, without it, we see no means of accounting for N'gbala and Branscombe's (1997) and our own failure to find an action effect in a between-participants design. To the best of our knowledge, no such claim has previously been made in the literature on mental models. However, comparisons between model sets are likely to occur in cases involving social comparison (for a review, see Wood, 1996), either when a comparison is explicitly called for or when some similarity in the contents of model sets that represent different individuals facilitates a comparison between them.

In conclusion, we have outlined how the mental model theory might be applied to the action effect in counterfactual thinking so that it can account for N'gbala and Branscombe's (1997) and our own results. The application of the theory suggested here led to several novel predictions that have been confirmed by our experiments. By applying the model theory to a phenomenon that appears to result from simple social comparison processes, we hope that our work adds weight to the argument recently made by Byrne and her colleagues (Byrne, 1997; Byrne & McEleney, 2000; McCloy & Byrne, 2000; Walsh & Byrne, 2004) that the theory may be applied to social cognitive phenomena as well as to the key phenomena of deductive reasoning.

REFERENCES

Baron, J., & Ritov, I. (1994). Reference points and omission bias. *Organizational Behavior & Human Decision Processes*, **59**, 475-498.

Boles, T. L., & Messick, D. M. (1995). A reverse outcome bias: The influence of multiple reference points on the evaluation of outcomes and decisions. *Organizational Behavior & Human Decision Processes*, **61**, 262-275.

Byrne, R. M. J. (1997). Cognitive processes in counterfactual thinking about what might have been. In D. L. Medin (Ed.), *The psychology of learning and motivation: Advances in research and theory* (Vol. 37, pp. 105-154). San Diego: Academic Press.

Byrne, R. M. J. (2002). Mental models and counterfactual thinking. *Trends in Cognitive Sciences*, **6**, 405-445

Byrne, R. M. J., & McEleney, A. (2000). Counterfactual thinking about actions and failures to act. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, **26**, 1318-1331.

Gentner, D., & Gunn, V. (2001). Structural alignment facilitates the noticing of differences. *Memory & Cognition*, **29**, 565-577.

Gentner, D., & Markman, A. B. (1997). Structure mapping in analogy and similarity. *American Psychologist*, **52**, 45-56.

Gilovich, T., & Medvec, V. H. (1994). The temporal pattern to the experience of regret. *Journal of Personality & Social Psychology*, **67**, 357-365.

Gleicher, F., Kost, K. A., Baker, S. M., Strathman, A. J., Richman, S. A., & Sherman, S. J. (1990). The role of counterfactual thinking in judgments of affect. *Personality & Social Psychology Bulletin*, **16**, 284-295.

Johnson-Laird, P. N. (1983). *Mental models: Towards a cognitive science of language, inference, and consciousness*. Cambridge, MA: Harvard University Press.

Johnson-Laird, P. N., & Byrne, R. M. J. (1991). *Deduction*. Hove, U.K.: Erlbaum.

Johnson-Laird, P. N., & Byrne, R. M. J. (2002). Conditionals: A theory of meaning, pragmatics, and inference. *Psychological Review*, **109**, 646-678.

Johnson-Laird, P. N., Legrenzi, P., Girotto, V., Legrenzi, M. S., & Caverni, J.-P. (1999). Naive probability: A mental model theory of extensional reasoning. *Psychological Review*, **106**, 62-88.

Kahneman, D., & Miller, D. (1986). Norm theory: Comparing reality to its alternatives. *Psychological Review*, **93**, 136-153.

Kahneman, D., & Tversky, A. (1982). The psychology of preferences. *Scientific American*, **246**, 136-142.

Landman, J. (1987). Regret and elation following action and inaction: Affective responses to positive versus negative outcomes. *Personality & Social Psychology Bulletin*, **13**, 524-536.

Markman, A. B., & Gentner, D. (2005). Nonintentional similarity processing. In R. R. Hassin, J. S. Uleman, & J. A. Bargh (Eds.), *The new unconscious* (pp. 107-137). New York: Oxford University Press.

Markman, K. D., Gavanski, I., Sherman, S. J., & McMullen, M. N. (1993). The mental simulation of better and worse possible worlds. *Journal of Experimental Social Psychology*, **29**, 87-109.

McCloy, R., & Byrne, R. M. J. (2000). Counterfactual thinking about controllable events. *Memory & Cognition*, **28**, 1071-1078.

Mellers, B. A. (2000). Choice and the relative pleasure of consequences. *Psychological Bulletin*, **126**, 910-924.

Mellers, B. [A.], Schwartz, A., & Ritov, I. (1999). Emotion-based choice. *Journal of Experimental Psychology: General*, **128**, 332-345.

N'gbala, A., & Branscombe, N. R. (1997). When does action elicit more regret than inaction and is counterfactual mutation the mediator of this effect? *Journal of Experimental Social Psychology*, **33**, 324-343.

Ritov, I., & Baron, J. (1995). Outcome knowledge, regret, and omission bias. *Organizational Behavior & Human Decision Processes*, **64**, 119-127.

Seta, J. J., McElroy, T., & Seta, C. E. (2001). To do or not to do: Desirability and consistency mediate judgments of regret. *Journal of Personality & Social Psychology*, **80**, 861-870.

Thompson, V., & Byrne, R. M. J. (2002). Reasoning about things that didn't happen. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, **28**, 1154-1170.

Walsh, C. R., & Byrne, R. M. J. (2004). Counterfactual thinking: The temporal order effect. *Memory & Cognition*, **32**, 369-378.

Wood, J. V. (1996). What is social comparison and how should we study it? *Personality & Social Psychology Bulletin*, **22**, 520-537.

Zeelenberg, M., van den Bos, K., van Dijk, E., & Pieters, R. (2002). The inaction effect in the psychology of regret. *Journal of Personality & Social Psychology*, **82**, 314-327.

Zeelenberg, M., van der Pligt, J., & de Vries, N. K. (2000). Attributions of responsibility and affective reactions to decision outcomes. *Acta Psychologica*, **104**, 303-315.

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